

Final Smithed Kernels

A smithed kernel is a file that contains information used to determine observation geometry parameters for an image, and the geometry information is an improvement/correction of the reconstructed kernels. The kernel information is needed to convert from a raw image, such as an EDR or RDR, to a map-projected product. The current standard THEMIS image pointing kernel is based on the THEMIS ISIS3 camera model and is the default kernel used by the ISIS program “spiceinit.” The kernels derived from the THEMIS control network offer a significant improvement over the THEMIS camera model kernels. Although THEMIS band 9 (centered at a wavelength of 12.57 μm) was used to generate the control network, the improved pointing knowledge can be applied to all bands (using the ISIS program “spiceinit”) to achieve improved geometry information for any band.

There are two separate smithed kernels and ancillary file sets; one for the daytime IR control network and one for the nighttime IR control network. To achieve the most accurate pointing information, the smithed CK and SPK kernels should be used together. These files can be downloaded from the below tar file:

[THEMIS_IR_SmithedKernels_USGS_March2019.tar.gz](#)

This tar file contains the following files:

1. Final Smithed Kernels

CK Kernels:

themis_dayir_merged_2018Jul13_ck.bc
themis_nightir_merged_2018Mar02_ck.bc

SPK Kernels:

themis_dayir_merged_2018Jul13_spk.bsp
themis_nightir_merged_2018Mar02_spk.bsp

2. Kernel summary file

CK Kernel summary files:

themis_dayir_merged_2018Jul13_ck.doc
themis_nightir_merged_2018Mar02_ck.doc

SPK Kernel summary files:

themis_dayir_merged_2018Jul13_spk.doc
themis_nightir_merged_2018Mar02_spk.doc

These files includes the pedigree for the final smithed kernel, a listing of all images in the kernel, and all original kernel files used in the control network, and all original kernel files used in the control network.

3. File list for images included in the kernel

themis_dayir_merged_2018Jul13_kernel_filelist.txt
themis_nightir_merged_2018Mar02_kernel_filelist.txt

To use the improved kernels, point to the kernel file when initializing geometry information using the ISIS3 program “spiceinit.” An example “spiceinit” command is:

```
spiceinit from=l012345678.lev1.cub ck= themis_dayir_merged_2018Jul13_ck.bc spk= themis_dayir_merged_2018Jul13_spk.bsp
```

When the new kernel is applied correctly to an image, the user will see the following in the image label:

InstrumentPositionQuality = Reconstructed

InstrumentPointingQuality = Unknown

If the image is not contained in the kernel, the user will see the following type of error: **"Unable to initialize camera model"**